TANTA UNIVERSITY

FACULTY of ENGINEERING

DEPARTMENT OF ELECTRICAL POWER AND MACHINES ENGINEERING

EXAMINATION (SECOND YEAR) STUDENTS OF ELECTRICAL ENGINEERING

COURSE TITLE: ELECTRICAL POWER ENGINEERING (1)			COURSE CODE: EPM2105
DATE: 16/1/2016	TERM: MID_TERM	TOTAL ASSESSMENT MARKS: 20	TIME ALLOWED: 1 HOURS

Q1: (5 Marks) **Fill in the blanks by inserting appropriate words**

a) If sag in overhead line increases, tension in the line ……

b) The balancer machine connected to the heavily loaded side works as a ……..…..

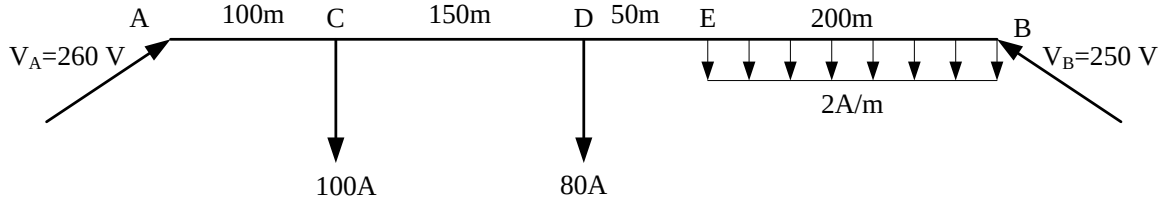
c) A shorter string has ……**string efficiency than a longer one.**

d) The longer the cross arm, the ……....**the string efficiency.**

e) **If the spacing between the conductors is increased, the capacitance of the line is**……

Q2: (10 Marks)

Two-wire dc distributor AB is fed from both ends as shown in the following figure. The resistance per 1000 meters is 1 Ohm. Calculate the current in various sections of the feeder, the minimum voltage and the point at which it occurs in the system. Draw the load current and voltage drop diagrams.



Q3: (5 Marks)

A string insulator has 3 units and each unit has a safe working voltage of 20 kV. Find the maximum line voltage on which it can be operated safely and find the string efficiency. The ratio of self-capacitance to shunt capacitance of each unit is 5:1. Derive any expression used.

Good Luck

1. Fill in the blanks by inserting appropriate words

a) If sag in overhead line increases, tension in the line ***decreases***.

b) The balancer machine connected to the heavily loaded side works as a ***generator***.

c) A shorter string has ***more*** string efficiency than a longer one.

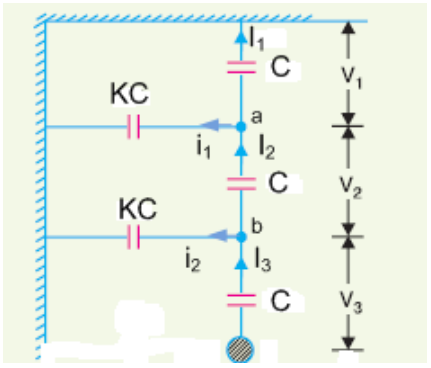
d) The longer the cross arm, the ***greater*** the string efficiency.

e) If the spacing between the conductors is increased, the capacitance of the line is ***decreases***.

2. KCL at node (a) $I_2 = I_1 + i_1$

$wCV_2 = wCV_1 + wkCV_1$

$V_2 = V_1(1+k)$ $\quad ----------> (1)$



KCL at node (b) $I_3 = I_2 + i_2$

$wCV_3 = wCV_2 + wkC(V_1 + V_2)$

$V_3 = V_2 + k(V_1 + V_2)$

$V_3 = (1+k)V_2 + kV_1 = (k + (1+k)^2)V_1 ---> (2)$

$V_3 = 20\ kV, \quad V_1 = 20/1.64 = 12.195\text{kV}$

$V_2 = V_1(1+k) = 12.195 \times 1.2 = 14.634\text{kV}$

$V_3 = (k + (1+k)^2)V_1 = 1.39 \times 8.197 = 11.399\ \text{kV}$

$V_{ph} = V_1 + V_2 + V_3 = 46.829kV$

$V_L = \sqrt{3}\, V_{ph} = 81.015\ kV$

$\mu = \dfrac{V_{ph}}{3 \times V_3} = 78.05\%$

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3. $R = 0.001\Omega/m, \quad \Delta V_{AB} = 0 = 0.1I_A + 0.15(I_A - 100) + 0.05(I_A - 180) + \int_0^{200} 0.001(I_A - 180 - 2x)dx$

$\Delta V_{AB} = 10 = 0.1I_A + 0.15(I_A - 100) + 0.05(I_A - 180) + 0.001(I_A\, x - 180x - x^2)]_0^{200}$

$0.5I_A = 110, \quad I_A = 220A$ $\quad ---->> I_B = 360A$

point of* min *voltage at* 320m *from feeding A, orpoint of* min *voltage at* 180m *from feeding B

$V_{Min} = V_B - \int_0^{180} 0.001(I_B - 2x)dx = 250 - 0.001(360x - x^2)]_0^{180} = 217.6V$